

METAL CASTING

Project Fact Sheet



METALLIC RECOVERY AND FERROUS MELTING PROCESSES

BENEFITS

- Improved energy efficiency when melting scrap metal to produce cast iron by improving elemental recovery and reducing melt losses.
- Improved utilization of ferrous scrap metal improves the life-cycle of ferrous materials.
- Reduced reliance on expensive and energy-intensive ferroalloys and low-alloy pig iron to achieve acceptable alloy chemical compositions in scrap melting for ferrous materials.
- Reduced landfilling requirements for scrap metal.

APPLICATIONS

The reduction in the amount of slag waste produced and enhance the utilization of the scrap metal recycle stream, can be applied across the ferrous casting industry wherever scrap materials are used.

ANALYSIS REDUCES SLAG WASTE AND ENHANCES UTILIZATION OF SCRAP METAL

The foundry industry recycles significant quantities of scrap metal. Certain quantities of scrap are unusable because impurities lead to increased oxidation and other defects. These must then be redirected to other heats. The majority of scrap melting losses are due to charge material or melt practices that lead to excessive oxidation. To meet tight specification some operations, premium scrap is cleaned and segregated at the source to ensure reproducible results. This research, conducted by Tri-State University, The University of Missouri at Rolla and industry partners, will improve the effective recover and reuse of scrap metal. Metallic recovery includes not only recovery of base metal but recovery of costly and energy-intensive alloying elements.

Statistically significant correlations will predict the effects of melting parameters on the recovery of metallic materials from scrap remelting processes. Parameters to be investigated include:

- 1) rust content of charge materials
- 2) surface area-to-volume ratio of the charge materials
- 3) oxygen potential in the headspace gases, and
- 4) use of inert gas cover procedures

As a further step, the research team will do an initial study of composition adjustment by thermochemical processing after melting in order to remove undesirable trace elements for ductile iron production.

METALLIC RECOVERY



Tapping a test into capture pig.



Project Description

Goals: The goals of this R&D project are as follows:

- Provide statistically significant information of the magnitude of the effects of charge material characteristics and melting procedures on the recovery of total metal and specific important alloying elements when melting scrap materials.
- Provide quantitative data on the effects of melting procedures and briquette formulation on melt loss and recovery of alloying elements from briquetted machining chips.
- Develop practices to reduce the amount of undesirable trace elements in a scrap-melted composition by thermochemical processing rather than dilution. After a sufficient understanding is achieved, outline a specific plant trail to validate the approach.

Progress and Milestones

This two-year R&D project was awarded in November 2001. Planned tasks include:

- **Task I-Charge Properties and Procedures** – Characterize charge design matrix.
- **Task II-Briquette Formulation and Melting Procedures** – Characterize components followed by design and executing of the melting matrix.
- **Task III-Ladle Metallurgy** – Process thermodynamic analysis and execute test heats.

Commercialization Plan

This research will be performed with oversight from the American Foundry Society (AFS) Charge Materials Committee. Research results will be disseminated through panel presentations and technical papers at the AFS Casting Congress as well as through articles in technical journals.



PROJECT PARTNERS

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